

AMENDMENT TO CLAIMS:

1. (Cancelled)

2. (Cancelled)

3. (Currently Amended) A method for increasing the specific activity of a mutated glycosyl hydrolase on a substrate relative to an unmutated form of the glycosyl hydrolase, comprising replacing an active site associated glycosyl-stabilizing amino acid of the hydrolase with an amino acid, the replacing amino acid binding cellobiose less tightly than the glycosyl-stabilizing amino acid to provide a mutant glycosyl hydrolase-, said glycosyl-stabilizing amino acid is selected from the group consisting of tryptophan and comprises tyrosine and said replacing amino acid is selected from the group consisting of alanine, valine, serine, glutamic acid, arginine and comprises glycine.

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

7. (Currently Amended) The methods of claim-3, wherein the mutant glycosyl hydrolase is selected from the group consisting of comprises:

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT
GCACGGTCTCTGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCGG
CTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGCC
GAACAGCATCAATTTTTACCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGCA
GGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTGA

CCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTCT
CGGAGGCTACGTGGATTTCCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAAC
CCGACGGTCGTTCGGCTTTGACTTGCACAACGAGCCGCATGACCCGGCCTGCTGGGGC
TGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAAACGCCGT
GCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCTGAAGGTGTGCAGAGCTACAACGG
AGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTGC
TGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCGGC
CCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAACATGCCCGGCATCTGGAAC
AAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATTC
GGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGTA
CCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCTG
GAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTCG
ACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTCGATTTTCGATCCTGTCT
AATGAATCGCCTAGCAGTCAACCGTCCCCGTCGGTGTGCGCCGTCTCCGTCGCCGAGC
CCGTCGGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGCC
AACGCTGACCCCTACTGCTACGCCCACGCCCACGGCAAGCCCGACGCCGTCACCGA
CGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGGC
AAT.

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT
GCACGGTCTCCGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCG
GCTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGC

CGAACAGCATCAATTTTTACCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGC
AGGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTG
ACCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTC
TGGGAGGCTACGTGGATTTCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAA
CCCGACGGTCGTCGGCTTTGACTTGACAAACGAGCCGCATGACCCGGCCTGCTGGGG
CTGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAAACGCCG
TGCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCGAAGGTGTGCAGAGCTACAACG
GAGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTG
CTGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCTA
CCCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAAACATGCCCGGCATCTGGAA
CAAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATT
CGGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGT
ACCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCT
GGAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTC
GACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTCGATTTTCGATCCTGTC
TAATGAATCGCCTAGCAGTCAACCGTCCCCGTCGGTGTCGCCGTCTCCGTCGCCGAG
CCCGTCGGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGC
CAACGCTGACCCCTACTGCTACGCCCACGCCACGGCAAGCCCGACGCCGTACCCG
ACGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGG
CAATGGCTTCACGGTAACGGTGGCCGTGACAAATTCCG, and

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT

GCACGGTCTCTGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCGG
CTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGCC
GAACAGCATCAATTTTCGGCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGCA
GGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTGA
CCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTCT
CGGAGGCTACGTGGATTTCCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAAC
CCGACGGTCGTCGGCTTTGACTTGCACAACGAGCCGCATGACCCGGCCTGCTGGGGC
TGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAACGCCGT
GCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCGAAGGTGTGCAGAGCTACAACGG
AGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTGC
TGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCTAC
CCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAACATGCCCGGCATCTGGAAC
AAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATTC
GGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGTA
CCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCTG
GAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTCG
ACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTCGATTTTCGATCCTGTCT
AATGAATCGCCTAGCAGTCAACCGTCCCCGTCGGTGTCGCCGTCTCCGTGCGCCGAGC
CCGTGCGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGCC
AACGCTGACCCCTACTGCTACGCCCACGCCACGGCAAGCCCGACGCCGTCACCGA
CGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGGC
AATGGCTTCACGGTAACGGTGGCCGTGACAAATTCCG

SEQ ID NO: 2-Y245G, SEQ ID NO:3 Y42R, SEQ ID NO:4 W82R, or a mixture thereof.

8. (Cancelled)
9. (Cancelled)
10. (Cancelled)
11. (Cancelled).
12. (Cancelled)
13. (Cancelled)
14. (Cancelled)
15. (Cancelled)
16. (Cancelled)
17. (Cancelled)
18. (Cancelled)
19. (Cancelled)
20. (Cancelled)
21. (Cancelled)
22. (Cancelled)
23. (Cancelled)
24. (Cancelled)
25. (Cancelled)
26. (Cancelled)
27. (Cancelled)
28. (Cancelled)

29. (Currently Amended) A method for increasing the specific activity of

Acidothermus cellulolyticus of E1 endoglucanase on a biomass, comprising replacing, by site-

directed-mutagenesis, an active site associated glycosyl-stabilizing amino acid of the endoglucanase with an amino acid, the replacing amino acid binding cellobiose less tightly than the glycosyl-stabilizing amino acid to provide a mutant endoglucanase; said glycosyl-stabilizing amino acid is selected from the group consisting of tryptophan and comprises tyrosine and the replacing amino acid ~~comprises~~ is selected from the group consisting of alanine, valine, serine, glutamic acid, arginine and glycine.

30. (Cancelled)

31. (Currently Amended) The method of claim 29, wherein the mutant endoglucanase is selected from the group consisting of:

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT
GCACGGTCTCTGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCGG
CTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGCC
GAACAGCATCAATTTTTACCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGCA
GGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTGA
CCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTCT
CGGAGGCTACGTGGATTTCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAAC
CCGACGGTCGTCGGCTTTGACTTGACACAACGAGCCGCATGACCCGGCCTGCTGGGGC
TGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAAACGCCGT
GCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCGAAGGTGTGCAGAGCTACAACGG
AGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTGC
TGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCGGC
CCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAAACATGCCCGGCATCTGGAAC

AAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATTC
GGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGTA
CCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCTG
GAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTCG
ACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTCGATTTTCGATCCTGTCT
AATGAATCGCCTAGCAGTCAACCGTCCCCGTGGTGTCGCCGTCTCCGTCGCCGAGC
CCGTCGGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGCC
AACGCTGACCCCTACTGCTACGCCACGCCACGGCAAGCCCGACGCCGTCACCGA
CGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGGC
AAT,

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT
GCACGGTCTCCGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCG
GCTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGC
CGAACAGCATCAATTTTTACCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGC
AGGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTG
ACCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTC
TCGGAGGCTACGTGGATTTCCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAA
CCCGACGGTCGTCGGCTTTGACTTGACAAACGAGCCGCATGACCCGGCCTGCTGGGG
CTGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAAACGCCG
TGCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCGAAGGTGTGCAGAGCTACAACG
GAGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTG

CTGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCTA
CCCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAAACATGCCCGGCATCTGGAA
CAAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATT
CGGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGT
ACCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCT
GGAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTC
GACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTTCGATTTTCGATCCTGTC
TAATGAATCGCCTAGCAGTCAACCGTCCCCGTCGGTGTGCGCGTCTCCGTCGCCGAG
CCCGTCGGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGC
CAACGCTGACCCCTACTGCTACGCCCACGCCCACGGCAAGCCCGACGCCGTACCG
ACGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGG
CAATGGCTTCACGGTAACGGTGGCCGTGACAAATTCCG, and

GCGGGCGGCGGCTATTGGCACACGAGCGGCCGGGAGATCCTGGACGCGAACAAACGT
GCCGGTACGGATCGCCGGCATCAACTGGTTTGGGTTCGAAACCTGCAATTACGTCGT
GCACGGTCTCTGGTCACGCGACTACCGCAGCATGCTCGACCAGATAAAGTCGCTCGG
CTACAACACAATCCGGCTGCCGTACTCTGACGACATTCTCAAGCCGGGCACCATGCC
GAACAGCATCAATTTTCGGCAGATGAATCAGGACCTGCAGGGTCTGACGTCCTTGCA
GGTCATGGACAAAATCGTCGCGTACGCCGGTCAGATCGGCCTGCGCATCATTCTTGA
CCGCCACCGACCGGATTGCAGCGGGCAGTCGGCGCTGTGGTACACGAGCAGCGTCT
CGGAGGCTACGTGGATTTCCGACCTGCAAGCGCTGGCGCAGCGCTACAAGGGAAAC
CCGACGGTCGTCGGCTTTGACTTGCAACAACGAGCCGCATGACCCGGCCTGCTGGGGC
TGCGGCGATCCGAGCATCGACTGGCGATTGGCCGCCGAGCGGGCCGGAAACGCCGT

GCTCTCGGTGAATCCGAACCTGCTCATTTTCGTCGAAGGTGTGCAGAGCTACAACGG
AGACTCCTACTGGTGGGGCGGCAACCTGCAAGGAGCCGGCCAGTACCCGGTCGTGC
TGAACGTGCCGAACCGCCTGGTGTACTCGGCGCACGACTACGCGACGAGCGTCTAC
CCGCAGACGTGGTTCAGCGATCCGACCTTCCCCAACAACATGCCCGGCATCTGGAAC
AAGAACTGGGGATACCTCTTCAATCAGAACATTGCACCGGTATGGCTGGGCGAATTC
GGTACGACACTGCAATCCACGACCGACCAGACGTGGCTGAAGACGCTCGTCCAGTA
CCTACGGCCGACCGCGCAATACGGTGCGGACAGCTTCCAGTGGACCTTCTGGTCCTG
GAACCCCGATTCCGGCGACACAGGAGGAATTCTCAAGGATGACTGGCAGACGGTCG
ACACAGTAAAAGACGGCTATCTCGCGCCGATCAAGTCGTCGATTTTCGATCCTGTCT
AATGAATCGCCTAGCAGTCAACCGTCCCCGTCGGTGTGCGCCGTCTCCGTGCGCCGAGC
CCGTGCGCGAGTCGGACGCCGACGCCTACTCCGACGCCGACAGCCAGCCCGACGCC
AACGCTGACCCCTACTGCTACGCCCACGCCCACGGCAAGCCCGACGCCGTACCCGA
CGGCAGCCTCCGGAGCCCGCTGCACCGCGAGTTACCAGGTCAACAGCGATTGGGGC
AATGGCTTCACGGTAACGGTGGCCGTGACAAATTCCG

~~SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4~~, or a mixture thereof.